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COMPLIMENTS OF THE AUTHOR.

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THE PREVENTION OF HERNIA AFTER INCISION OF
THE ABDOMINAL WALLS.¹

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On June 27, 1891, I saw, with Drs. A. Frech and C. Nicolai, her attendant physicians, a stout lady suffering for many years past from a large umbilical hernia. The hernia had become irreducible four or five days previously, symptoms of strangulation had manifested themselves, and the skin and fat overlying the hernial tumor were in a state of low phlegmonous inflammation. All attempts at reduction failed, the lady's condition became critical and herniotomy was performed late at night on June 29th, with the kind assistance of Drs. Frech, Nicolai and Torek. After opening the sac it was found to contain the stomach, omentum and greater part of the small intestines, all adherent to each other and to the sac wall. After liberation of adhesions, reduction of the hernial contents, and ligation and removal of the sac, a large hernial aperture, circular in form, ten to twelve centimeters in diameter, with thin aponeurotic margins and situated in the median line just above the umbilicus, confronted us. The thin, sharp, fibrous margin was split all around by the knife to the depth of a little over a centimeter to obtain fresh surfaces for union, and the margins of the ring were brought together by transverse sutures in such a manner as to form a longitudinal line of union when approximated. The intra-abdominal tension, however, was so great that it required all my strength, without exaggeration, to draw together and tie the sutures. I recognized that sutures embracing both the skin and the margins of the hernial aperture, if tight enough to close the latter, would inevitably strangulate the already inflamed

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presented by the author



skin and fat. Buried sutures to close the hernial aperture were a necessity. Catgut was tried, but the great tension opened the knots of the slippery material as fast as I could tie them. Interrupted sutures of heavy pedicle silk were used until my supply gave out, when I closed the balance of the aperture with interrupted silkworm-gut sutures. Ten silk and nine silkworm-gut sutures were thus placed and buried by closing over them, with catgut sutures, the skin and fat. The patient unexpectedly recovered from the operation, or rather from the condition which necessitated it, and still more unexpectedly was radically cured of her hernia, and remains so cured to this day. Now comes the part that is pertinent to the subject of this evening. Beginning with three and ending with seven months after operation, every one of the buried silk sutures, one by one, ulcerated to the surface and was removed. Not one of the silkworm-gut sutures came away, but all remain in situ to the present day. After the removal of the last silk suture the little sinuses closed and the wound healed definitely.

This experience of a year and nearly a half ago induced me to employ the buried silkworm-gut suture in isolated cases of abdominal section where the tension upon the lips of the wound was exceptionally great. Meeting in each instance with the same favorable experience as in my first case, the idea finally dawned upon me: Why not suture every operative wound of the abdominal parietes with buried silkworm gut? A better and, in view of the non-absorbability of silkworm gut, more permanent provision against the occurrence of hernia could not be imagined.

Acting upon this thought I have since May 1st of the present year closed all wounds of the abdominal parietes, made by me, in the fashion presently to be detailed. That part of my work, during the months of May, June, July and October, to which the method was applicable, embraced sixteen cœliotomies, nine operations for shortening the round ligaments, five single and one double nephrorrhaphy. In all, forty-one incised wounds of the abdominal parietes, in which, at a low estimate, upward of two hundred and fifty silkworm-gut sutures were buried.

The interrupted buried suture of silkworm gut, placed three or four to the inch, was invariably used. In closing cœliotomy wounds each buried suture included fascia, muscle and peritoneum, care being exercised, of course, that the cut edges of each of these tissues be accurately opposed to each other. In my modification of the operation for shortening the round ligaments the anterior wall of the inguinal canal is slit open along its whole length (New York Medical Journal, October 11,

1890). In sewing up, each buried suture embraces the lips of the wound of the aponeurosis of the external oblique and that portion of the drawn-out round ligament which comes to lie in the canal. In performing nephrorrhaphy the buried sutures pierce the muscles and fascia of the abdominal walls, the fatty capsule and capula propria of the kidney and the kidney itself. In tying each silkworm suture a double or friction-knot is first applied and on top of this two single knots. The ends are then cut as short as possible. Such a knot properly and tightly tied never slips nor opens.

It will thus be seen that in each wound the buried silkworm suture embraces all the cut tissues except the skin and the subcutaneous fat. In ventro-fixation, nephrorrhaphy and shortening of the round ligaments, the uterus, kidney and round ligaments respectively are likewise embraced in the loop of the suture. The skin and fat are united over the buried silkworm sutures by a running suture of catgut drawn just tight enough to gently approximate the cut edges. Of course, any other material may be used instead of catgut, to unite the skin. Catgut has the advantage of lasting long enough to insure firm union and of not requiring removal.

We all know that, in closing wounds of the abdominal parietes, if all the tissues are embraced in one loop of whatsoever suture you please, the tension necessary to securely hold together the deeper parts, the muscles and fascia, is so great as to cause the suture to cut through the skin and subcutaneous fat. Often also to cause necrosis of parts of the fatty tissue embraced and thus interference with wound-healing. In line with good surgery, therefore, is the principle to apply separate sutures to tissues of different densities and under different degrees of tension.

Why is silkworm gut preferable to silk, silver wire, kangaroo tendon and catgut for buried sutures of wounds of the abdominal walls? With silk it shares the properties of ease of tying and of permanency, but excels it in non-irritating and aseptic qualities. Silver wire is equally permanent and equally aseptic; it is, however, more troublesome to tie, less pliable after burial, and the metal cut ends are perhaps more irritating than the ends of silkworm gut. Kangaroo tendon and catgut are absorbable and cannot, therefore, give a permanent guarantee against hernia; besides which no reliance can be placed upon the durability of the buried knot after it becomes moistened.

Of what avail is kangaroo tendon, or eight-day, eighteen-day, or even twenty-eight-day catgut, if the buried knot slips or opens on the

first, second or third day, as I have frequently known it to do. Besides which, it is a mistake to take it for granted that sutures become superfluous after a week, or two, or even three, and that union by that time is so strong as to defy separation, especially in wounds of the abdominal walls, which are exposed to strains such as obtain no where else in the body. I have repeatedly known diastasis of the recti and separation of the fascia along the line of incision to occur in coeliotomy scars six months and longer after operation. Whether the intestines will then prolapse far enough through the rent to form a constantly visible question is merely a question of length of mesentery in the particular patient.

Differences of opinion as to what constitutes a ventral hernia will possibly explain the discrepancies in results claimed by different operators. The man who insists on the presence of a constantly visible tumor before he admits a ventral hernia may have quite a long series of cases without this unfortunate result. The more self-critical and less easily satisfied surgeon will record as a ventral hernia every case in which, after coeliotomy, the recti and the fascia separate along the line of incision so as to leave the abdominal contents, at that point, separated from the external world only by a covering of peritoneum, fat and skin. Applying this criterion, ventral herniæ following coeliotomy are by no means as infrequent as we would desire them to be.

Silkworm gut, then, is the material par excellence for buried sutures of wounds of the abdominal walls; its non-irritating properties, its non-absorbability and the security of the knot render it about ideal.

Of course the *conditio sine quâ non* in its successful use is perfect asepsis. Next in importance comes the matter of not drawing it so tightly as to strangulate the tissues embraced in the loop. Care in tying the knots and in cutting the ends *very* short are points not to be lost sight of. With all the above conditions fulfilled, nothing but satisfaction will result from the use of the buried silkworm suture.

I sterilize my silkworm gut by boiling for an hour in water and then transfer it to five per cent. carbolic acid solution, where it is kept until wanted.

I will now endeavor to answer a few objections that may be made against the use of buried silkworm sutures.

First, they may cause suppuration and ulcerate out. To this I answer they will not do so, except as a matter of mere accident, if buried aseptically and not drawn so tight as to strangulate the tissues.

This answer is based upon experience. Of all the silkworm sutures I have ever buried but two have appeared again, and that in a patient in whom, three weeks after a ventro-fixation of the uterus, a slight separation of the lips of the cutaneous wound occurred as the result of a *trauma*. Two of the buried silkworm sutures became infected and were cut out. Then the wound again closed, permanently burying the four sutures remaining in situ. In all the other wounds in which I buried silkworm sutures I obtained primary union and permanent retention of the sutures.

Another objection that may be raised is that the buried sutures may travel in the tissues, or perhaps even wander inward into the peritoneal cavity. A moment's thought, however, will show that if the sutures change position at all, it will be in the direction of the knot, *i. e.* toward the surface of the body.

Cutting *very* short the ends, after the knot is tied, will protect against a third possibility:—the protrusion, later on, of the cut ends through the skin. Even should this happen the surgeon could then remove that particular suture, or the patient may be instructed to seize the projecting end, pull upon it until the knot appears, cut the loop on one side behind the knot and withdraw the suture. This necessity has never arisen in my practice.

In performing ventro-fixation of the uterus I have fastened the uterus to the abdominal wall by two or three of the buried silkworm sutures used to close the peritoneum, muscle and fascia. I confess I had some misgivings in those cases where a subsequent pregnancy was possible, as to whether the uterus in that event would be able to tear itself away from the buried suture. None of my patients thus operated on has as yet become pregnant and personal experience on this point is wanting. Recorded experience, however, goes to show that pregnancies have occurred and gone to term without a hitch in uteri ventrofixated with buried silk.

The special advantage of this method of suture:—buried silkworm for the deeper tissues, catgut for the skin and subcutaneous fat—over other methods, as applied to very fat patients, is self-evident.

With this method of suture of the wound I have allowed my coeliotomy cases to get up a week earlier than formerly. They now, as a rule, leave bed at the end of two, and hospital at the end of two-and-a-half to three weeks. Nor do I require my patients any longer to wear an abdominal supporter after operation. At first, I confess, I was afraid to do without them. As experience and my confidence in the

buried silkworm suture grew, I gradually abandoned the supporter, and now advise against its use after operation, nor have I thus far had occasion to regret this course in a single instance. My patients have thus gained in three directions:—a shorter convalescence, relief from the annoyance and expense of abdominal supporters, and greater security against hernia.

The writer feels that, as far as he is concerned, the question of the prevention of abdominal hernia following operations is practically solved. It was my intention to pursue these observations a little further before reporting upon the matter, but when I was requested by your presiding officer to prepare a short paper for this evening I found I had nothing else to offer which would be likely to interest you. I close with the hope that this communication may induce my colleagues to give the method advocated a trial. If they derive from it the same satisfaction that I have, I will be sure of their thanks.

To prevent misunderstanding and possible misinterpretation I will distinctly state that I do not advance any claim to priority in the use of the buried silkworm suture. I was led to it by necessity, June 29th, 1891, and practiced it in a desultory fashion until May 1st, 1892, since when I have applied it to every incised wound of the abdominal wall I have had occasion to make. Until four or five months ago I was unaware that any one else was systematically using the buried silkworm suture; since that time, however, I have learned of quite a number of surgeons using it in practically the same way as myself. If anything has been published upon the subject it has escaped my attention.

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